WHAT IS CLAIMED IS:

1. A system for interrogating a sample using at least one probe configured to be responsive to the sample wherein the at least one probe generates identifiable signals following interaction with the sample and wherein the sample composition is resolved, at least in part, by identifying the signals associated with the at least one probe and wherein the signals comprise a first signal component indicative of a relative abundance of a first particle species and a second signal component indicative of a relative abundance of a second particle species, the system comprising:

a detector configured to detect at least a portion of the signals associated with the at least one probe wherein the position of each probe and the signal arising therefrom are used to identify the presence or absence of particles contained within the sample and wherein the detector is configured to operate at different configurations that result in different detector output signals in response to the signals; and

a controller configured to control the detector's operational configuration such that the detector can be operated at a first configuration and a second configuration wherein the first configuration is adapted to measure the first signal component in an effective manner and the second configuration is adapted to measure the second signal component in an effective manner and wherein the controller is further configured to combine the measurements of the first and second signal components measured at their respective first and second configurations so as to yield a representation of the signals that includes the first and second signal components.

2. The system of Claim 1, wherein the detector's ability to be operated at the first and second configurations facilitate an improved identification of the presence or absence of particles contained in the sample when the range of relative abundances of the particles is relatively large.

3. The system of Claim 1, wherein the detector comprises a charge-coupled device (CCD) having an array of pixels wherein each pixel is adapted to collect charge in response to the signals and wherein the pixel has an upper limit on the amount of charge it can collect.

4. The system of Claim 3, wherein the amount of charge collected for a given intensity of the signal is generally proportional to the duration of collection and wherein the amount of charge collected for a given duration is generally proportional to the intensity of the intensity of the signal.

5. The system of Claim 4, wherein the first configuration comprises a short duration T1 of charge collection and the second configuration comprises a long duration T2 of charge collection such that the short duration T1 allows collection of charge associated with a relatively strong intensity component of the identifiable signal and the long duration T2 allows collection of charge associated with a relatively weak intensity component of the identifiable signal.

6. The system of Claim 5, wherein the long duration T2 is selected so as to allow sufficient charge to be collected as a result of the weak component and wherein such a value of T2 may result in the strong component to exceed the upper limit on the amount of collectable charge.

7. The system of Claim 6, wherein the value of the strong component at the long duration T2 can be approximated by scaling the value of the strong component measured at the short duration T1 thereby allowing representation of the strong component of the identifiable signal at a value that exceeds the upper limit.

8. The system of Claim 7, wherein the strong component from the T1 collection is scaled by a value given by a ratio of T2/T1.

9. The system of Claim 1, wherein the at least one probe comprises a plurality of probes forming a probe array.

10. The system of Claim 9, wherein the probes are arranged on the probe array in known positions or orientations.

11. The system of Claim 1, wherein the detector comprises a charge multiplier adapted to receive the detectable signal at a cathode and in response emit photoelectrons that are multiplied by a gain and supplied to an anode wherein the gain depends on the charge multiplier's operating voltage V raised to a selected power and wherein the charge multiplier has a usable range of gain values.

12. The system of Claim 11, wherein the charge multiplier comprises a photomultiplier tube (PMT) having an output signal associated with the charge supplied to the anode.

13. The system of Claim 11, wherein the charge multiplier comprises a charge intensifier and wherein the anode comprises a phosphor screen that emits electromagnetic radiation from a localized area thereon in response to the receipt of the multiplied electrons.

14. The system of Claim 13, wherein the charge intensifier further comprises a CCD that detects the localized emission of the electromagnetic energy from the phosphor screen.

15. The system of Claim 11, wherein the first configuration comprises the multiplier operated at a first voltage V1 so as to result in a first gain and wherein the second configuration comprises the multiplier operated at a second voltage V2 so as to result in a second gain.

16. The system of Claim 15, wherein the first voltage V1 comprises a low voltage selected to allow effective measurement of a strong component of the signal and wherein the second voltage V2 comprises a high voltage selected to allow effective measurement of a weak component of the signal.

17. The system of Claim 16, wherein the value of the high voltage V2 is selected to allow sufficient gain of photoelectrons resulting from the weak component and wherein such a value of V2 may result in the strong component to result in the strong component to exceed an upper limit associated with the usable range of gain values.

18. The system of Claim 17, wherein the value of the strong component at the high voltage V2 can be approximated by scaling the value of the strong component measured at the low voltage V1 thereby allowing representation N1' of the strong component of the identifiable signal at a value that exceeds the upper limit.

19. The system of Claim 18, wherein the representation N1' of the strong component at the high voltage V2 scale is approximated by a relation $\log(N1') = m\log(V2/V1)$ where m represents a slope of a curve obtained by plotting the multiplier's gain versus the voltage in a log-log manner.

20. A method for improving the measurement of one or more types of specific particles of a sample using a detector associated with a biological analysis system wherein the specific particles are adapted to emit identifiable signals based on the interaction of the specific particles with corresponding probes and wherein the identifiable signals are captured by the detector to yield an output signal and wherein the detector is adapted to be operated at different configurations that respond differently to the identifiable signals, the method comprising:

performing a first measurement of the identifiable signals with the detector at a first configuration such that the detector yields a first output signal wherein the first configuration allows effective measurement of a first type of the specific particles;

performing a second measurement of the identifiable signals with the detector at a second configuration such that the detector yields a second output signal wherein the second configuration allows effective measurement of the second type of the specific particles; and

combining the first and second output signals to obtain a representation of the identifiable signals wherein the representation of the identifiable signals includes effective representations of the first and second types of the specific particles to thereby allow improved identification of the specific particles within the sample.

21. The method of Claim 20, wherein the first measurement at the first configuration is adapted to effectively measure a relatively strong component of the identifiable signals associated with the first type of the specific particles having a relatively high abundance.

22. The method of Claim 21, wherein the second measurement at the second configuration is adapted to effectively measure a relatively weak component of the identifiable signals associated with the second type of the specific particles having a relatively low abundance.

23. The method of Claim 22, wherein combining the first and second output signals comprises scaling the first output signal to a scale associated with the second configuration such that the based on the second configuration, the weak component is

effectively measured and the strong component is effectively represented based on the scaling of the effectively measured value from the first configuration.

24. The method of Claim 23, wherein the scaling of the strong component allows effective representation of both weak and strong components when a dynamic range associated with the detector is limited and would not be able to measure the strong component at the second configuration.

25. The method of Claim 24, wherein the detector is a charge-coupled device and the first configuration comprises a short exposure duration T1 selected to effectively measure the strong component of the identifiable signals.

26. The method of Claim 25, wherein the second configuration comprises a long exposure duration T2 selected to effectively measure a weak component of the identifiable signals.

27. The method of Claim 26, wherein the scaling of the first output signal comprises multiplying the first output signal value by a ratio T2/T1.

28. The method of Claim 24, wherein the detector is a charge multiplier and the first configuration comprises a low operating voltage V1 selected to effectively measure the strong component of the identifiable signals.

29. The method of Claim 28, wherein the second configuration comprises a high operating voltage V2 selected to effectively measure a weak component of the identifiable signals.

30. The method of Claim 29, wherein the scaling of the first output signal comprises determining the scaled value N1' of the first output signal based on a relationship $\log(N1') = m\log(V2/V1)$ where m represents a slope of a curve obtained by plotting the multiplier's gain versus the voltage in a log-log manner.

31. The method of Claim 30, wherein the charge multiplier comprises a photomultiplier tube.

32. The method of Claim 30, wherein the charge multiplier comprises a charge intensifier.

33. A method extending the effective dynamic range of a detector that measures detectable signals from a sample undergoing a biological analysis wherein the detectable

signals comprise two or more components representative of two or more components of the sample, the method comprising:

obtaining a first output signal from the detector operated at a first configuration that allows effective measurement of a first component of the detectable signals;

obtaining a second output signal from the detector operated at a second configuration that allows effective measurement of a second component of the detectable signals wherein the second configuration is such that the first component of the detectable signals would fall outside the detector's dynamic range at the second configuration; and

scaling the first output signal to a scale associated with the second configuration wherein the amount of scaling depends on the first and second configurations and wherein the scaled first output signal allows representation of the first output signal at the second configuration thereby extending the effective dynamic range of the detector and wherein such extension of the effective dynamic range allows improved characterization of the sample having a relatively large range of relative abundances of the two or more components.

34. The method of Claim 33, wherein the first configuration is adapted to effectively measure a strong component of the detectable signals.

35. The method of Claim 34, wherein the second configuration is adapted to effectively measure a weak component of the detectable signals.

36. The method of Claim 35, wherein scaling the first output signal allows representation of both weak and strong components when the dynamic range associated with the detector is limited and would not be able to measure the strong component at the second configuration.

37. The method of Claim 36, wherein the detector is a charge-coupled device and the first configuration comprises a short exposure duration T1 selected to effectively measure the strong component of the detectable signals.

38. The method of Claim 37, wherein the second configuration comprises a long exposure duration T2 selected to effectively measure a weak component of the detectable signals.

39. The method of Claim 38, wherein the scaling of the first output signal comprises multiplying the first output signal value by a ratio T2/T1.

40. The method of Claim 36, wherein the detector is a charge multiplier and the first configuration comprises a low operating voltage V1 selected to effectively measure the strong component of the detectable signals.

41. The method of Claim 40, wherein the second configuration comprises a high operating voltage V2 selected to effectively measure a weak component of the detectable signals.

42. The method of Claim 41, wherein the scaling of the first output signal comprises determining the scaled value N1' of the first output signal based on a relationship $\log(N1') = m\log(V2/V1)$ where m represents a slope of a curve obtained by plotting the multiplier's gain versus the voltage in a log-log manner.

43. The method of Claim 42, wherein the charge multiplier comprises a photomultiplier tube.

44. The method of Claim 42, wherein the charge multiplier comprises a charge intensifier.